

**ADVANCED BEOL INTERCONNECT STRUCTURES WITH
LOW-K PE CVD CAP LAYER AND METHOD THEREOF**

ABSTRACT OF THE DISCLOSURE

An advanced back-end-of-line (BEOL) metallization structure is disclosed. The structure includes a diffusion barrier or cap layer having a low dielectric constant (low-k), where the cap layer is formed of silicon nitride by a plasma-enhanced chemical vapor deposition (PE CVD) process. The metallization structure also includes an inter-layer dielectric (ILD) formed of a carbon-containing dielectric material having a dielectric constant of less than about 4, and a continuous hardmask layer overlying the ILD which is preferably formed of silicon nitride or silicon carbide. A method for forming the BEOL metallization structure is also disclosed. The method includes a pre-clean or pre-activation step to improve the adhesion of the cap layer to the underlying copper conductors. The pre-clean or pre-activation step comprises exposing the copper surface to a reducing plasma including hydrogen, ammonia, nitrogen and/or noble gases.